**Diurnal Variation of Precipitation during MC3E Campaign**

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The diurnal variation of precipitation processes in the United States (US) is well recognized but incompletely understood (Cabone *et al.* 2002). The diurnal cycle of precipitation has been studied using surface rainfall data, radar reflectivity data, and satellite-derived cloudiness and precipitation (Wallace 1975; Dai *et al.* 1999; Carbone *et al.* 2002; Carbone and Tuttle, 2008; Parker and Ahijevych, 2007; Matsui *et al.* 2010 and others). These observations indicate that the summer-time precipitation most of the North America and typically feature late-afternoon precipitation maxima. These diurnal variation of precipitation can also be generally categorized into three different types: 1) afternoon rainfall maxima due to mesoscale and local circulations over the south and east of the Mississippi and Ohio valleys, 2) nocturnal rainfall maxima from eastward-propagating mesoscale convective systems (MCSs) over the Lee side of Rocky Mountain regions and 3) afternoon rainfall maxima in the Appalachian Mountains, and then propagate eastward toward the coast.

The main objective of this paper is to use a regional cloud-scale model with very high-resolution (i.e., WRF) to examine the WRF ability to simulate diurnal variation of precipitation. Specifically, the study will (1) identify the physical processes responsible to diurnal variation of precipitation, (2) examine the sensitivity of resolution (2, 6, 18, and 30 km) to model simulated diurnal variation of precipitation and (3) identify the relationships between microphysics and cumulus parameterization schemes. In addition,

this study will compare the model simulations with observation and previous modeling studies.